ORIGINAL ARTICLE

MICROBIOLOGICAL PROFILE AND COMMONLY USED ANTIBIOTICS SUSCEPTIBILITY PATTERN OF ISOLATES AMONG BURN PATIENTS AT A TERTIARY CARE HOSPITAL

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ABSTRACT

Objective: To assess frequency of different pathogens in burn patients and susceptibility pattern of commonly used antibiotics.

Material and Methods: In this prospective study, burn patients (admitted or visited OPD) of Ayub Teaching Hospital, Abbottabad, Pakistan from January 2013 to December 2015 were registered. Mainly wound swab and blood specimen (along with all sort of culturing isolates) were collected from burn patients and were cultured by aseptic conventional method with the intention of observing microbial pathogens. Microbiological profile and antibiotic susceptibility pattern was collected using standard collection techniques and analyzed at local private laboratory.

Results: Among total 491 clinical isolates, 241 (49%) were observed positive. Frequency of pathogens isolated; Pseudomonas aeruginosa 163 (68%), Staphylococcus aureus 43(18%), E.coli 14(6%), Candida albicans 10(4%), Klebsiella pneumoniae 6 (2%), Salmonella species 2(1%), Proteus species 2(1%) and 1(0.4%) Streptococcus pyogenes. Among these isolates Pseudomonas aeruginosa, Escherichia coli and Staphylococcus Aureus revealed 80±10 % resistant to Ampicillin, Co-Amoxiclav, Amoxicillin, Clarithromycin, Methicillin, and Vancomycin. The rate of bacteremia was 49% among burn patients isolates.

Conclusion: Regular antibiotic sensitivity testing should be done for each patient in order to select an appropriate antimicrobial agent.

Key Words: Burns, Antibiotic Resistance, MRSA, Multidrug Resistant, Microbial Infections.

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INTRODUCTION

In burns patients, infections make morbidity and mortality higher. Burns are one of the most common and devastating forms of trauma which requires specialized care in Intensive Care Units (ICU) in order to decrease the rate of morbidity and mortality of effected people[1]. Frequency of burns patients is significantly higher in economically underdeveloped and developing countries, which can be caused by contact with hot surface, liquids or fire[2]. Large open wound containing necrotic tissue along with immunosuppression of burn patients make them more vulnerable towards infections and favor colonization and multiplication of pathogens[3-4]. In spite of considerable advancement in the treatment of burns, approximately 73% of all death occurs within the first 5 days of post-burn. Death in such cases have been shown to be directly or indirectly caused by bacteria[5].

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Different patient groups such as burn patients and trauma patients have unique predisposition to different infections. In a Swedish study, the most common infection was burn wound infection (60%) followed by blood stream infection (20%), urinary tract infection (20%), and pneumonia (10%) respectively[6].

The organisms that predominate as causative agents of burn wound infection in any burn treatment facility changes over time. Gram-positive organisms are primarily dominant as compared to Gram-negative opportunistic organisms[7]. However, the common isolated pathogens are *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Klebsiella Spp*, various *Coliform bacilli* and Fungi (*Candida albicans*, *Aspergillus fumigatus*)[8,9]. Furthermore their frequencies reported were *Pseudomonas aeruginosa* (38%), *Staphylococcus aureus* (20%), and *Acinetobacter baumanni* (10%)[10]. Multidrug resistant bacteria have frequently been reported as the cause of nosocomial outbreaks of infection in burn units or as colonizers of wounds of burn patients[11,12]. *Pseudomonas aeruginosa* develops resistance against antimicrobial drugs more rapidly by producing exopolysaccharide that binds with water and form gels making it resistant to many antibiotics hence making treatment even more complicated[13-17].

To evaluate newer therapies for wound infections, it becomes essential to qualify and quantify bacteria's which are involved in causing different infections. Large numbers of clinical studies are carried out to determine the flora of burn wounds in different parts of the world. It showed that the general bacterial flora of burn wounds may be different in different clinical settings[18].Regarding the significance of infection in burn victims, it is necessary for every burn unit to rule out the pattern and incidence of dominant flora of burn patients. In this perspective the present study was planned to sort out the pattern of burn wounds microbial colonization in our population, in order to determine the most frequent microbial isolates in our burn patients along their antibiotic sensitivity patterns towards commonly used antibiotics.

MATERIAL AND METHODS

This study was conducted in the department of Pathology, Ayub Teaching Hospital, Abbottabad, Pakistan from January 2013 to December 2015. In this 2 year prospective study total 491 isolates were collected from all admitted burns cases and cases with minor burn dealt in emergency at Ayub Teaching Hospital during 2013 and 2015 after taking proper consent. Specimens of their wound swabs and blood (along with urine, throat swab, CVP tips, nasal swab, dressing gauze, urinary catheter, ETT tips, oral swab) were collected, labeled and transported following standard microbiology sample collection and transportation procedures culture and sensitivity. The collected swabs were inoculated onto Blood agar and MacConkey agar. Selective media like Mannitol Salt Agar was also used in order to differentiation between S*. aureus* and *P. aeruginosa*. After the incubation for 24 hours at 37˚C the isolates were identified and separated on basis of their colony characteristics, pigment formation for *P. aeruginosa* (Pyocyanin and Pyoverdine) along with biochemical tests (Catalase and Coagulase) in addition to Gram staining as described by Parvin et al. 2009[19]. Antibiotic sensitivity of different isolates was done using disc diffusion method on Muller–Hinton agar plate[17]. For the antibiotic sensitivity discs were placed on the culture inoculated agar plate surface. After overnight incubation at 37˚C, the zone of inhibition exhibited by each antibiotic was measured in millimeter (mm).

RESULTS

This study was conducted on 491 wound swab and blood culture for microbiological profiling and commonly used drug susceptibility. In 491 burn patients 211 males (43%) and 280 females (57%) with age ranges of burn patients were 1 year to 71 years with a median age of 28.

About 241 isolates were positive for microbial growth with 49% rate of bacteremia. In 241 microbial positive isolates the frequency of pathogens isolated was *Pseudomonas aeruginosa* 163(68%) followed by *Staphylococcus aureus* 43(18%), *E. coli* 14(6%), *Candida* 10(4%), *Klebsiella* 6(2%), *Salmonella* 2(1%), *Proteus* 2(1%) and *Strep pyogenes* 1(0.4%). Among these isolates *Pseudomonas aeruginosa*, *E. coli* and *Staphylococcus aureus* revealed 80±10% resistant

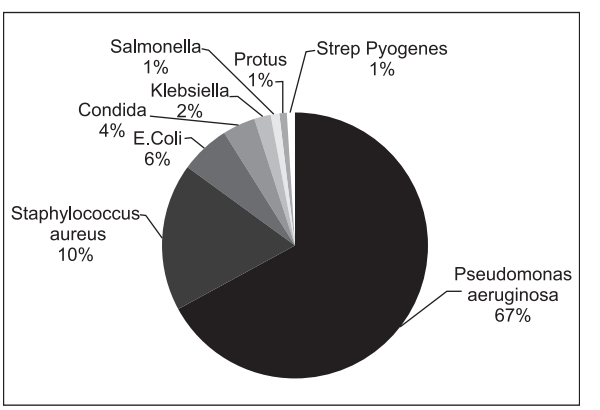

Figure 1: Frequency of bacterial isolates from burns patients

Table 1: Antibiotic sensitivity of wound isolates

Antibiotics	Resistant pattren of wound isolates							
	Pseudomonas aeruginosa	Staph aureus	E.coli	Candida albicanus	Klebsiella spp	Proteus spp	Salmo-nella	Strep Pyogenes
Ampicillin	100	100	100	ND	ND	ND	ND	ND
Augmentin	90.1	24.3	92.3	ND	60	0.0	ND	0.0
Amoxicillin	96.4	66.6	0.0	ND	ND	100	ND	ND
Clarithromycin	96.7	50	100	ND	ND	ND	ND	ND
Cefpirome	92	33.3	100	ND	ND	100	ND	ND
Ciprofloxacin	56.8	64.2	42.8	ND	33.3	100	ND	ND
Cefepime	56	62.5	40	ND	66.6	0	ND	100
Ceftazidime (Fortum)	75.3	72.7	85.7	ND	66.6	50	ND	0.0
Enoxabid	75	40	100	ND	100	50	ND	ND
Gentamycin	77.1	33.3	85.7	ND	100	50	ND	ND
Imipenem	17.1	48.1	20	ND	100	0.0	50	0.0
Methicillin	100	56.6	ND	ND	ND	ND	100	ND
Sparaxin	32.9	8	25	ND	ND	50	ND	ND
Sulzone (Cephoperazone)	35.3	51.7	18.1	ND	0.0	0.0	100	0.0
Tobramycin	74.3	52.9	66.6	ND	100	ND	ND	100
Tarivid (Ofloxacin)	71.8	44.4	62.5	ND	ND	ND	33.3	100
Teicoplanin	89.4	9.0	100	ND	ND	100	0.0	0.0
Vancomycin	88.4	11.7	100	ND	ND	ND	0.0	ND

to Ampicillin, Augmentin, Amoxicillin, Clarithromycin, Methicillin, and Vancomycin.

The proportion of these isolate were predominantly increased in samples from Pus 254(52%), Blood 79 (16%), Urine 47(10%), Throat Swab 28(6%), CVP Tips 21(4%), Nasal swab 17(3%), Dressing Gauze 14(3%), Catheter 12(2%), ETT Tips 12(2%), Axillary Swab 06(1%), Oral Swab 01 (0.2%). It is worth mentioning that in our samples *Pseudomonas aeruginosa* and *Staph aureus* are frequent in pus while *E. coli* in urine and *Salmonella* species in blood samples. Antibiotic Sensitivity of wound isolates are shown in Table 1.

DISCUSSION

Burn wound is considered to be one of the major health problem worldwide[20]. Regardless of significant improvement in the survival of burn patients, infectious complications still continue to be the major cause of morbidity and mortality in burn patients[21]. In our current study female population are being more effected by burns (57%) as compared to males (43%). Our results are in line with results reported by a study in which they revealed that incidence of burn cases are much higher in females 53.2% as compared to males 39.2%[22]. This may due to domestic and household responsibilities of females in our setup which make them more prone to burns.

In our study *P. aeruginosa* was the most frequent microbe found in our patients. These result are similar to other studies that were conducted on burns patients[23-24]. In striking contrast to our finding, some published studies have reported *S. aureus* as their predominant microbe of burn wound infections[25-26]. *Klebsiella* spp was reported only (2%) in current study which is too much lower than the study which shown (31%)[27].

In our study 57% Staph aureus were resistant to Methicillin this support the study conducted in Iran which revealed Methicillin resistant were 58%[14] but opposing to study conducted in Hyderabad revealed 33% respectively[27]. *Pseudomonas aeruginosa* revealed 80±10% resistant to Ampicillin, Co-Amoxiclav, Amoxicillin, Clarithromycin, Methicillin, and Vancomycin which confirmed the previous studies[14-28].

The present study should prompt well designed local studies to confirm and improve our findings. *P.*

aeruginosa, S. aureus constituted the most common bacterial microbes of burn wounds in our patients. A variable antibiotic susceptibility pattern was observed among the grown microbes. Early excision of deep burns and coverage with skin graft can help to effectively reduce the burden of these infections. With this evidence base in mind, we can revisit our policy of empiric antibiotic cover for our burn injury patients with sepsis.

CONCLUSION

The two predominant microbes of in burn patients were *Pseudomonas aeruginosa* and *Staphylococcus aureus*. Multidrug-resistant microbial infections are becoming gradually common and difficult to treat.

RECOMMENDATIONS

Selection of appropriate antibiotics after sensitivity testing is very important in treating not only burn wound infection but any bacterial infection. Secondly hospital should have strict antibiotic policy for burn patients in order to treatment properly and prevent the spread of multi-drug resistant and community acquired wound infections pathogens. It's the era of molecular analysis so it is recommended that genes associated with different antibiotics should be evaluated mutations conferring resistance.

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AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under:

Khattak AA:	Concept, design acquisition of data ,manuscript Writing
Awan UA:	Sample collection and lab Analysis
Haq M:	literature review and statistical analysis
Khalid S:	Bibliography Statistical analysis
Ashraf F:	data analysis and result interpretation
Nadeem MF:	sample collection and reference collection

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.